# STATEMENT OF BASIS

## Multi-Media Permit Modification

## T & R Electric Supply Company

## Colman, South Dakota

**South Dakota Department of Environment and Natural Resources**

# TABLE OF CONTENTS

**Page**

# 1.0 BACKGROUND

T & R Electric Supply was issued a multi media environmental permit on November 3, 1998. The multi media environmental permit contains waste management requirements and includes a minor air quality permit. The minor air quality permit contains federally enforceable operational limits that maintain air emissions below the major source threshold under the Title V air quality operating permit program.

On July 17, 2003, T & R Electric Supply submitted a renewal application for the air portion of its multi media environmental permit. The permit was modified in June 2008 to include Unit #3. On March 17, 2005, the current permit was issued. On December 11, 2008, T&R Electric submitted an application to modify the existing permit by allowing the burning of used oil containing PCB levels of 2 to 49 ppm in the Al-Jon furnace**.** The permit was considered to be complete on February 20, 2009.

There have been no complaints or violations filed against this facility since the last permit review.

# 2.0 OPERATIONAL DESCRIPTION

T&R Electric Supply Company recovers recyclable metals by processing electrical equipment that contained transformer oil with less than 50 parts per million (ppm) polychlorinated biphenyl's, hereinafter "PCBs". The transformer oil is sampled and tested for the level of PCBs to ensure that the concentration is less than 50 ppm. The electrical equipment is drained, disassembled and degreased. The facility recovers recyclable metals by processing drained electrical equipment in a wire reclamation furnace. Electrical equipment includes, but is not limited to, transformers, regulators, and oil switches but does not include cable or wire that is not a component of the electrical equipment. Two spray booths are used to paint rebuilt transformers using an airless electrostatic method.

T&R Electric's operation is classified under the Standard Industrial Code – 3612-Power, Distribution, and Specialty Transformers. This classification includes establishments primarily engaged in manufacturing power, distribution, instrument, and specialty transformers.

## 2.1 Existing Equipment

Table #2-1 provides a description of the permitted units, which was derived from the existing permit.

***Table #2-1***
**Description of Permitted Units, Operations and Processes**

| Identification | Description | Maximum Operating Rate | Control Device |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Unit #1 | 1990 Al-Jon United 3000 (model #G-466) multi chambered wire reclamation furnace. The unit is used to process drained electrical equipment that contained transformer oil with less than 50 parts per million polychlorinated biphenyls (PCBs). | 10,000 pounds per batch. Each batch takes approximately three hours to complete | The wire reclamation furnace is equipped with an afterburner fired with transformer oil containing PCBs less than two parts per million and distillate oil. |
| Unit #2 | 1992 Custom Paint Boot Corporation (model #CPBC402020) paint booth. The unit is used to paint rebuilt transformers using an airless electrostatic spraying method. | 42,000 cubic feet per minute at 1.0" at standard pressure | The paint booth is equipped with six, 2 foot by 15 foot polyester fiber filter pads. |
| Unit #3 | 2002 J.B.J. (model #JDB-1218-S) paint booth. The unit is used to undercoat rebuilt transformers using an airless electrostatic spraying method. | 10,500 cubic feet per minute at 0.25" at standard pressure | The paint booth is equipped with twenty four, 20 inch by 20 inch polyester fiber filter pads. |

Both the primary chamber and the afterburner of the 1990 Al-Jon United 3000 wire reclamation furnace are fired with mineral oil containing less than 2 ppm PCBs. Prior to the primary chamber being charged with a load, the afterburner is brought up to temperature. The permit requires that a minimum afterburner temperature of 1,800 degrees F be maintained. T&R operates the afterburner at a minimum operating temperature of 2,200 degrees F.

Permit Condition 6.7 of the multi-media permit requires that used oil burned in the wire reclamation furnace must be tested by the owner or operator to determine whether the oil contains less than 2 ppm PCBs and meets the used oil specifications found in ARSD 74:28:27:01.

## 2.2 Existing Potential Emissions

Table 2-2 summarizes the existing potential emissions as derived from the existing permit and Statement of Basis.

**Table #2-2**
**Potential Emissions Summary**

| Criteria Pollutants | Total |
|---|---|
| TSP | 0.7 tons per year |

| | |
|---|---|
| $SO_2$ | 23.3 tons per year |
| NOx | 3.3 tons per year |
| VOC | 55.1 tons per year |
| CO | 0.8 tons per year |
| | |
| **HAP Pollutants** | |
| HCl | 7.8 tons per year |
| Dioxins/Furans | $9.24 \times 10^{-8}$ tons per year |
| Lead | 0.1 tons per year |
| Methyl Alcohol | 0.4 tons per year |
| Toluene | 0.4 tons per year |
| Xylene | 13.9 tons per year |

### 2.3 Proposed Modification

T&R Electric seeks to modify Section 8.3 of the existing air quality permit to allow the burning of used mineral oil that contains PCB levels of 2 to 49 ppm as a supplementary fuel to fire the furnace, Unit #1.

The afterburner will be initially fired with less than 2 ppm fuel until it reaches the 1,800 degrees F. operating temperature. Once the afterburner is up to temperature, the fuel will be switched to mineral oil containing 2 ppm to 49 ppm PCBs. Then, the primary chamber of the furnace would be charged with a load of combustible material. The fuel system for the afterburner will be set to automatically switch the fuel supply from the 2 to 49 ppm PCB oil to the less than 2 ppm oil if the temperature in the afterburner falls below 1,800 degrees F.

## 3.0 POTENTIAL EMISSIONS

### 3.1 Emission Factors

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

T&R Electric submitted a stack test that was performed in 1989 in Goldsboro, North Carolina, on a 5,000 pound per batch wire reclamation furnace. The stack test determined emission rates

for particulate, hydrogen chloride and dioxins/furans. The sulfur dioxide ($SO_2$), nitrogen oxide (NOx), and carbon monoxide (CO) emissions will be based on fuel oil combustion in a boiler. The emission factors for boilers using distillate oil are derived from AP-42 – Fifth Edition, Tables 1.3-1, 9/98.

### 3.2 Potential Emission Estimates

Potential emissions are based on operating at full capacity, 24 hours per day, 7 days per week unless there are enforceable permit conditions that restrict the operations below the maximum capacity of the unit or hours of operation.

The proposed modification to increase the PCB content of the fuel burned in the afterburner of the wire reclamation could affect the potential emissions of HAPs, specifically Hydrogen Chloride and Dioxins and Furans. According to AP-42 1.3-3, emissions from fuel oil combustion depends on the grade and composition of the fuel, the type and size of the boiler, the firing and loading practices used, and the level of equipment maintenance. Particulate matter emissions are based upon the quantity of the material placed into the primary chamber, percent combustible material and the quantity of fuel used to burn the combustibles and fire the afterburner. The sulfur content of the fuel will not change and will be limited to 1%, which is required in the current permit. No change in the quantity of the fuel burned, amount of solvents and paints used in the spray booths, amount of combustible materials will occur. T&R only accepts transformers containing less than 49 ppm PCBs. Therefore, the potential emissions of particulate matter, SO2, NOx, CO will be unchanged. The volatile organic compounds (VOC) emissions are primarily a result of the operation of the spray booths – the proposed modification will not affect the spray booths. VOC emissions will be unchanged.

T&R Electric's application states that the 2 to 49 ppm PCB mineral oil would not be used to fuel the afterburner until the afterburner temperature had been brought up to operating temperature 1,800 degrees F) using less than 2 ppm PCB oil. Then, the combustible material is placed into the primary chamber. The primary chamber is also required to be fired with less than 2 ppm PCB oil. These requirements will be included in the multi-media permit. Therefore, the use of the afterburner will be considered as control equipment.

The performance standard for new wire reclamation furnaces was adopted by the state in April 1993 to minimize dioxin and furan emissions (Administrative Rule of South Dakota 74:36:07:29 – Operating requirements for wire reclamation furnaces). The state requires new wire reclamation furnaces to maintain a minimum temperature of 2,200 degrees Fahrenheit and a residence time at that temperature of two-seconds in the last chamber. The temperature and residence time limits were derived from federal requirements for the destruction of PCBs, § 761.70(a)(1)(i). The federal temperature limit and residence time were designed to destroy greater than or equal to 99.99 percent of the principle organic hazardous constituent. A control efficiency of 99.99% will be applied to the afterburner.

#### 3.2.1 Wire Reclamation Furnace

The burners for the wire reclamation furnace are rated at 5.25 million Btus per hour heat input. The potential amount of transformer oil that could be fired in the wire reclamation furnace is calculated using the following equation:

Maximum fuel consumption = (maximum rate ÷ fuel heat input x 8,760 hours/year)
= 5,250,000 Btus/hr ÷ 140,000 Btus/gallon x 8,760 hrs/yr
= 328,500 gallons/year

The maximum capacity of the 1990 Al-Jon/United wire reclamation furnace is 10,000 pounds per batch. Each batch consists typically of five percent combustibles and requires a three hour processing period. The process burns off the combustibles (plastic, residual oil, etc) from the electrical equipment. The following equation was used to determine the process rate for the wire reclamation furnace:

Combustibles = (10,000 pounds per batch x 5% combustibles) ÷ 3 hours per batch
= 167 pounds per hour

### 3.2.2 Hydrogen Chloride

A stack test submitted by T & R Electric Supply Company was performed on a wire reclamation furnace unit capable of processing 5,000 pounds of material per batch. The stack test was performed while burning wire only (13% combustibles) and wire with transformer cores (20% combustibles). One of the test pollutants was chloride (Cl) to determine hydrogen chloride emissions.

T & R Electric Supply will only process electrical equipment; therefore, hydrogen chloride emission rates for the wire/transformer test will be used in this review. The batch load during the test averaged 2,073 pounds, or 34.6 pounds per hour of combustible material**.** The temperature in the last chamber ranged from 1,805 to 2,000 degrees Fahrenheit. The calculations to convert the chloride emission rate to hydrogen chloride (HCl) were derived from 40 CFR Part 60, Appendix A, Method 26. The potential hydrogen chloride air emissions ($E_{HCl}$) are calculated below:

$E_{HCl}$ = 0.391 kg/hr Cl x $10^9$ μg/kg x 1.028 μg HCl/μg-mole x μg-mole/μg-Cl x 2.205 x $10^{-9}$ lbs/μg
= 0.89 lbs/hr

$E_{HCl}$ = (0.89 lbs/hr x 8,760 hrs/year)/ 2000 lbs/ton
= 3.9 tons/yr

T&R Electric Supply operates a 10,000 pound per batch unit which is double the size of the unit that was tested. Therefore, the emission rate will be doubled (1.78 pounds per hour) for evaluating T&R Electric Supply's operation. The revised hydrogen chloride emission rate for T & R Electric Supply will be:

EF = 2.0 x 0.89 lbs/hr = 1.78 lbs/hr

This assumption should be correct since hydrogen chloride emissions are related to the amount of chlorine in the material being combusted. The emission factor is the uncontrolled emission

rate based on the furnace not being equipped to control hydrogen chloride emissions. The following equation is used to calculate the hydrogen chloride emissions from T & R Electric Supply:

$E_{HCl}$ = 1.78 lbs/hr x 8,760 hrs/yr / 2,000 lbs/ton
= 7.80 tons/yr

However, the HCl emission rate also varies with the concentration of PCBs in the mineral oil used to fuel the furnace. The proposed modification would result in an increase of PCBs in the mineral oil from less than 2 ppm to 49 ppm.

Assuming 49 ppm PCBs by Volume = 0.0049%
Total mineral oil burned per year = 328,500 gallons
Density of PCBs = 13.1 lbs/gallon

PCBs burned = 0.000049 x 328,500 gallons/year x 13.1 lbs/gallon
PCBs burned = 211 lbs/year

Assuming that all of the PCBs are converted to HCl in the combustion process, and

Assuming a ratio of 1.03 molecules of chlorine to 1.0 molecule of PCB

HCl = 1.03 (211/bs/year)
HCl = 217 lbs/year

### 3.2.3 Dioxins and Furans

A stack performance test conducted in July, 1989, was performed in Goldsboro, North Carolina on a wire reclamation furnace unit rated at 5,000 pounds per batch. The average load while testing for dioxin (CDD) and furan (CDF) averaged 4,010 pounds per batch with 10% of the material being combustible or 133.7 pounds of combustibles per hour. The potential emissions of dioxins and furans ($E_{CDD\ and\ CDF}$) are calculated below:

$E_{CDD\ and\ CDF}$ = 9.59 micrograms (μg) per hour x 2.205 x $10^{-9}$ pounds per μg
= 2.11 x $10^{-8}$ pounds per hour

$E_{CDD\ and\ CDF}$ = (2.11 x $10^{-8}$ lbs/hr x 8,760 hrs/yr) / 2,000 lbs/ton
= 9.24 x $10^{-8}$ tons/year

T&R Electric Supply operates a 10,000 pound per batch unit which is double the size of the unit that was tested. Therefore, the emission rate will be doubled for evaluating T&R Electric Supply's operation. The revised CDD and CDF emission rate will be:

2.0 x 9.24 x $10^{-8}$ = 1.85 x $10^{-7}$ lbs/hr

$E_{CDD\ and\ CDF}$ = (1.85 x $10^{-7}$ lbs/hr x 8,760 hrs/yr) / 2,000 lbs/ton

$= 8.1 \times 10^{-7}$ tons/year

However, the Dioxin/Furan emission rate also varies with the concentration of PCBs in the mineral oil used to fuel the furnace. The proposed modification would result in an increase of PCBs in the mineral oil from less than 2 ppm to 49 ppm.

Assuming 49 ppm PCBs by Volume = 0.0049%
Total mineral oil burned per year = 328,500 gallons
Density of PCBs = 13.1 lbs/gallon

PCBs burned = 0.000049 x 328,500 gallons/year x 13.1 lbs/gallon
PCBs burned = 211 lbs/year

Assuming that all of the PCBs are converted to Dioxin/Furans in the combustion process, and Assuming a ratio of 1.14 molecules Dioxin to 1 molecule of PCBs

$E_{CDD \text{ and } CDF}$ = 1.14(211 lbs/yr)
$E_{CDD \text{ and } CDF}$ = 240 lbs/yr or 0.12 tons/yr

Controlled Emissions:

$E_{CDD \text{ and } CDF}$ = 240 lbs/yr x (1-99.99%)

$E_{CDD \text{ and } CDF}$ = 0.024 lbs/yr or $1.2 \times 10^{-5}$ tons/yr

The HCl emissions and the Dioxin/Furan emissions both assume that the maximum amount of PCBs is converted to HCl and Dioxin/Furan. As shown by the results of the 1989 stack test, burning PCBs results in a higher conversion of PCB to HCl than into Dioxin/Furans.

Table 3-1 Summarizes the changes in the potential emissions due to the proposed modification.

**Table #3-1**
**Potential Emissions Summary**

| Criteria Pollutants | Current Emissions (tons per year) | Change in Emissions w/Modification (tons per year) | Emissions with modification (tons per year) |
|---|---|---|---|
| TSP[1] | 0.7 | 0 | 0.7 |
| $SO_2$[1] | 23.3 | 0 | 23.3 |
| NOx[1] | 3.3 | 0 | 3.3 |
| VOC[1] | 55.1 | 0 | 55.1 |
| CO[1] | 0.8 | 0 | 0.8 |
| **Total Criteria Pollutants** | **83.2** | **0** | **83.2** |
| **HAP Pollutants** | | | |
| HCl | 7.8 | 0.11 | 7.9 |
| Dioxins/Furans | $9.24 \times 10^{-8}$ | $1.2 \times 10^{-5}$ | $1.21 \times 10^{-5}$ |
| Lead[1] | 0.1 | 0 | 0.1 |
| Methyl Alcohol[1] | 0.4 | 0 | 0.4 |
| Toluene[1] | 0.4 | 0 | 0.4 |
| Xylene[1] | 13.9 | 0 | 13.9 |
| **Total HAPs** | **22.6 tons per year** | | **22.6** |

1 The proposed modification would not affect the sources of these pollutants and would not result in any changes to the potential emissions.

# 4.0 PERMIT REQUIREMENTS

## 4.1 New Source Review

ARSD 74:36:10:01 notes that new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. T & R operates in Colman, South Dakota, which is in attainment for all the pollutants regulated under the Clean Air Act. Therefore, T & R is not subject to new source review.

## 4.2 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated pollutant. The following is a list of regulated pollutants under the PSD program:

- Total suspended particulate (PM);

- Particulate with a diameter less than or equal to 10 microns (PM10);
- Sulfur dioxide (SO2);
- Nitrogen oxides (NOx);
- Carbon monoxide (CO);
- Ozone – measured as volatile organic compounds (VOCs);
- Lead;
- Fluorides;
- Sulfuric acid mist;
- Hydrogen sulfide;
- Reduced sulfur compounds; and
- Total reduced sulfur.

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated pollutant. The major source threshold for all other sources is 250 tons per year of any regulated pollutant.

T & R is not considered one of the 28 named PSD source categories; therefore, the major source threshold is 250 tons per year. T & R's potential emissions are less than 250 tons per year; therefore, T & R is considered a minor source under this program and not subject to a Prevention of Significant Deterioration review.

### 4.3 New Source Performance Standards

Presently, there are no finalized or promulgated New Source Performance Standards applicable to this type of operation.

### 4.4 National Emission Standards for Hazardous Air Pollutants (NESHAP – Part 61)

Presently, there are no finalized or promulgated National Emissions Standards for Hazardous Air Pollutants standards applicable to this type of operation.

### 4.5 Maximum Achievable Control Technology Standards (MACT – Part 63)

Presently, there are no finalized or promulgated National Emissions Standards for Hazardous Air Pollutants standards applicable to this type of operation.

### 4.6 State Requirements

ARSD 74:36:07:29, Operating standards for new wire reclamation furnaces was adopted in April, 1993 to minimize dioxin and furan emissions. The state requires new wire reclamation furnaces to maintain a minimum temperature of 2,200 degrees Fahrenheit and a residence time at that temperature of two-seconds in the last chamber. The temperature and residence time limits were derived from federal requirements for the destruction of PCBs, § 761.70(a)(1)(i). The federal temperature limit and residence time were designed to destroy greater than or equal to 99.99 percent of the principle organic hazardous constituent.

Although T & R Electric Supply Company is not considered a new source, they agreed to operate at a minimum temperature of 2,200 degrees Fahrenheit and a residence time of two-seconds in the last chamber

### 4.6.1 Minor Air Quality Permit

T & R Electric Supply's potential emissions of hazardous air pollutants are greater than 10 tons per year for a single hazardous air pollutant. Therefore, T & R Electric Supply is considered a major source.

T & R Electric Supply accepted federally enforceable permit conditions which maintain the potential emissions of hazardous air pollutants below 10 tons per year for a single hazardous air pollutant and below 25 tons per year for a combination of hazardous air pollutants. Therefore, T & R Electric Supply is eligible for a minor air quality operating permit.

## 4.7 Summary of Applicable Requirements

T & R will be required to operate within the requirements stipulated in the following regulations under the minor permit program:

- ARSD 74:36:04 – Operating Permits for Minor Sources;
- ARSD 74:36:06 – Regulated Air Pollutant Emissions;
- ARSD 74:36:11 – Performance Testing;
- ARSD 74:36:12 – Control of Visible Emissions; and
- ARSD 74:36:13 – Continuous Emission Monitoring Systems.

# 5.0 RECOMMENDATION

Based on the information submitted in the air quality permit application, allowing the use of mineral oil containing less than 50 ppm PCBs to fuel the afterburner, will not significantly increase either the criteria pollutants or HAPs. Requirements for the monitoring of the PCB concentrations in the mineral oil, and operational requirements requiring that the afterburner is up to an operating temperature of 1,500 F prior to firing with the higher concentration oil will be included in the multi-media permit. The department recommends approval of the multi-media permit containing a synthetic minor air quality permit. Questions regarding this permit review should be directed to Keith Gestring, Natural Resources Engineer.

# Appendix A

**1.1 Operation of source.** In accordance with Administrative Rules of South Dakota (ARSD) 74:36:04:15(9), the owner or operator shall operate the units, controls, and processes as described in Table #1 and in accordance with the statements, representations, and supporting data contained in the complete permit application submitted July 17, 2003 (air quality), and July 17, 2003 (solid waste), **and the application for a modification to the permit received on December 11, 2008**, unless modified by the conditions of this permit. The application consists of the air quality and solid waste application forms, supporting data, and supplementary

correspondence. If the owner or operator becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in an application, such information shall be promptly submitted.

**5.6 Wire reclamation furnace -- temperature limit.** In accordance with ARSD 74:36:04:15(9), the owner or operator shall maintain a temperature at or greater than 1,800 degrees Fahrenheit in the afterburner chamber. The minimum temperature of 1,800 degrees Fahrenheit shall be maintained at all times during the operation of the wire reclamation furnace. This includes prior to igniting the batch load in the primary chamber and until all combustibles are completely combusted. **Only mineral oil that contains PCBs less than two (2)parts per million or distillate oil shall be used to fuel the afterburner chamber until the minimum temperature has been maintained. Mineral oil that contains PCBs less than fifty (50) parts per million shall be combusted in the afterburner chamber only after the required minimum temperature has been achieved. The fuel system for the afterburner shall be constructed and installed so that if the afterburner temperature falls below the required minimum temperature, the flow of mineral oil with a PCB concentration of less than fifty (50) parts per million shall automatically stop and switch to a fuel with a PCB concentration of less than two (2)parts per million or distillate oil. Use of any mineral oil containing PCB concentrations greater than two (2) parts per million during startup or shutdown of the wire reclamation furnace is prohibited.**

**6.7 Used oil specification test.** Used oil burned in the wire reclamation furnace for energy recovery must be tested by the owner or operator to determine whether the oil contains less than ~~two parts per million~~ **fifty parts per million** PCBs. **The owner or operator may test or use other documentation to determine whether the oil is considered on or off specification used oil as** ~~and meets the used oil specifications~~ found in ARSD 74:28:27:01(adopting by reference 40 CFR § 279).

**8.3 Operational restrictions on wire reclamation furnace.** The owner or operator shall process only drained electrical equipment, for thermal destruction and metal recovery, in the wire reclamation furnace. The owner or operator shall use ~~**only**~~ **either** mineral oil that meets the requirements of on-specification used oil as defined in ARSD 74:28:27:01(adopting by reference 40 CFR § 279) and contains PCBs less than ~~two~~ **fifty** parts per million or distillate oil, ~~to fuel the wire reclamation furnace~~ **or** ~~if mineral oil meeting the requirements of~~ **off-specification used oil as defined in ARSD 74:28:27:01 (adopting by reference 40 CFR 279)** ~~Subpart G and~~ **that contains PCBs less than fifty parts per million** ~~**PCBs**~~**, to fuel the wire reclamation furnace. Use of off-specification used oil requires the company** ~~**must**~~ **to meet all requirements specified under this chapter for burners of off-specification used oil.**